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CR-128083

Bimonthly Report: 7/4/72 - 9/4/72

ERTS Proposal No. 108

Remote Sensing of Ocean Currents

George A. Maul, Principal Investigator, GSFC ID-C0315

OBJECT

The object of this investigation is to locate ocean current boundaries by sensing the color change associated with the cyclonic edge of the zone of maximum horizontal velocity shear. The test site is the eastern Gulf of Mexico where the strongly baroclinic flow from the Yucatan Straits forms into the Loop Current. The research will attempt to use ERTS data in the investigation of ocean color sensing from simultaneous observations by ship and satellite.

FIELD DATA COLLECTION

A time-series of the Loop Current is being obtained by occupying the suborbital track of ERTS that passes into the Yucatan Straits every 36 days. The research vessel is on the suborbital track on the day of satellite transit collecting continuous chlorophyll-a, volume scattering, and radiometric temperature (in conjunction with the NOAA-2 IR sensors); hourly (15 km interval) expendable bathythermograph, surface bucket temperature and salinity samples are being obtained. During daylight, spectra of upwelling and downwelling radiance (400-800 nm) are being measured with a 1/4 meter Ebert scanning spectroradiometer. Upon reaching the Yucatan Straits a temperature/salinity/depth (STD) transect of nine stations is being made in order to determine the geostrophic current and transport fields. After the STD transect, the surface boundary of the Loop Current is being tracked using the same measurements outlined for the subsatellite track. A second STD transect of the Florida Straits from Key West to Havana is made in order to determine the discharge from the basin.

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1972 G.A. Maul (National Oceanic and
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WORK SUMMARY

Two cruises were undertaken during this reporting period. In July a cooperative investigation of upwelling spectral radiance by ship and aircraft was made with Warren Hovis (NASA, GSFC). In August the first of the time series of the Loop Current was made during the 20-VIII transect of ERTS. The attached cruise reports detail this work.

The processing of MSS tapes is progressing well due to the addition of Lt. Robert Qualset (NOAA Commissioned Corps) to the project. We are now able to read the CCT on the NOAA CDC 6600 in the format desired for mathematical manipulation. Two scenes of the ocean off Cape Hatteras were received and are being studied; initial evaluation is that cloudiness is too great to permit useful observations of the Gulf Stream.

Data processing from the cruises, cruise planning and chemical analysis of the samples consumed most of the reporting period. STD records and spectroradiometric records are being digitized; programs to manipulate the data are being adopted where applicable or developed where necessary.

WORK PLANS

Future cruises for the remainder of the fiscal year are planned as listed below; each date is the date of satellite transit:

25 September	1972
31 October	1972
6 December	1972
11 January	1973
16 February	1973
24 March	1973
29 April	1973
4 June	1973

The R/V BELLOWS is planned as the ship for this work in September and October; NOAA's R/V VIRGINIA KEY will be used starting in December.

Routine processing of the cruise data will continue

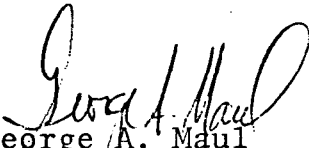
after each trip. Processing of ERTS data will commence when received.

DISCUSSION

No satellite data from the eastern Gulf of Mexico has been received and no aircraft data from the June experiment has been received from NASA MSC. At this juncture the lack of these data has not been detrimental to the project; further delay will begin to cause slippage.

Initial interpretation of the data confirms the basic oceanographic color signature of the Loop Current. The detection of the boundary layer in the deep sea will be significantly more difficult than near the coast at this time of year. Seasonal variability in the color is unknown at this time and is one of the goals of the experiment.

Note the new telephone number below.


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September 8, 1972

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
ATLANTIC OCEANOGRAPHIC AND METEOROLOGICAL LABORATORIES
PHYSICAL OCEANOGRAPHIC LABORATORY
NASA/GSFC
STATE UNIVERSITY SYSTEM INSTITUTE OF OCEANOGRAPHY

CRUISE REPORT

B-7210 R/V BELLOWS SUS-7211

19-27 AUGUST 1972

I. OBJECTIVIES

The purpose of this cruise was to commence a time-series of the location of the Loop Current as part of AOML's project with the Earth Resources Technology Satellite (ERTS) and the NOAA-2 Meteorological Satellite. The research vessel steamed along the suborbital track of ERTS that leads into the Yucatan Channel on the day of satellite transit. The research is intended to obtain baseline information on the spectroradiometric properties of the ocean's surface useful for remote sensing and the detection of that information at orbital altitudes.

II. SCHEDULE

<u>Date</u>	<u>Time</u>	<u>Activity</u>
August 19	EDT 0130	Depart St. Petersburg
20	1000	Satellite Transit
21	1100	Commence STD section of Yucatan Straits
22	1800	Commence Tracking Current
24	1600	Arrive Key West; fuel
24	2000	Depart Key West; commence STD section of Florida Straits

26	0100	Depart Florida Straits for St. Petersburg
27	0215	Arrive St. Petersburg

III. STATION LOCATION

The suborbital track occupied has the following beginning and ending coordinates:

27° - 44' N	84° - 30' W
22° - 32' N	85° - 34' W

The station locations for the Yucatan Straits STD transect were:

1.	21° - 50' N	85° - 11' W
2.	21° - 48' N	85° - 21' W
3.	21° - 46' N	85° - 32' W
4.	21° - 44' N	85° - 42' W
5.	21° - 42' N	85° - 53' W
6.	21° - 40' N	86° - 03' W
7.	21° - 38' N	86° - 13' W
8.	21° - 36' N	86° - 24' W
9.	21° - 34' N	86° - 34' W

The easternmost station was 12 n. mi. west of Cabo San Antonio; the westernmost station was 12n. mi. east of Isla Contoy.

The cruise from Isla Contoy to Dry Tortugas was a saw-toothed path which crossed the surface boundary layer zone of the current. The southern limit of the STD transect of the Florida Straits was 12 n. mi. north of Havana and terminated at the 100 fathom curve south of Marquesas Key Height. The station locations were:

10.	23° - 21' N	82° - 28' W
11.	23° - 31' N	82° - 25' W
12.	23° - 41' N	82° - 23' W
13.	23° - 51' N	82° - 21' W
14.	24° - 01' N	82° - 18' W
15.	24° - 11' N	82° - 16' W
16.	24° - 21' N	82° - 14' W

IV. PERSONNEL

1. G. Maul, NOAA/AOML, Chief Scientist
2. J. Holmes, NOAA/AOML, Graduate Assistant
3. I. Velez, NOAA/AOML, Physical Science Aide
4. G. Dingle, NOAA/AOML, Physical Science Aide
5. W. Paterson, SUSIO, Graduate Student

V. DESCRIPTION OF OPERATIONS

Data collection commenced at the northern end of the suborbital track. Continuous flow measurements of chlorophyll-a, were recorded on a dual channel recorder. While on the track, hourly XBT's, and surface salinity; half hourly measurements of scattering ratios and surface bucket temperature were taken. During appropriate daylight hours spectra of upwelling and downwelling visible radiation were observed hourly. Loran A fixes were made at half hourly intervals, and at major courses and/or speed changes. One liter samples were filtered for spectrophotometer calibration of chlorophyll-a every six hours.

STD stations were taken to 1000 meters or 100 meters from the bottom whichever is least. Surface and bottom calibration points were taken at each cast. Lowering speed was about 50 meters per minute; raising speed was the winch maximum. Loran positions were taken at the beginning of each and end of each cast.

The saw-toothed return trackline was run in the same manner as the suborbital transect. Course changes were made when the surface boundary layer was crossed when leaving the current and when the 22° C isotherm is greater than 100 meters when entering the current.

The infrared radiometer was not operating during the entire cruise due to an as yet undetermined electronic malfunction; bucket thermometer samples were substituted. A bubble trap was constructed from spare PVC parts which significantly improved the continuous flow fluorometer measurements; the cooperation of the ship's crew in the construction of this is gratefully acknowledged. The NOAA STD

failed after station 11; SUSIO's unit which was aboard due to the foresite of M. O. Rinkel was used the remainder of the cruise.

VI. LOGS

Chief Scientist
Deck Log
Track Chart
Loran Log (C & GS 722)
Hydrographic Station Log
Bathymograph Log

VII. CRITIQUE

I wish to thank Capt. Davis, his crew and the scientific party for their excellent cooperation and enthusiasm during the cruise and Ellen Murphy for her assistance in preparing the vessel before sailing with the SUSIO supplied scientific equipment. The R/V BELLOWS should have careful scrutiny on the part of Gulfstream Research and Development Corp because her navigation lights are illegal and the lifesaving apparatus is not adequate; a U.S. Coast Guard inspection should be passed before the vessel goes to sea again.

Submitted by: *George A. Maul*
George A. Maul
August 27, 1972

